

Computational Wind Tunnel: A Design Tool for Rotorcraft, Phase I

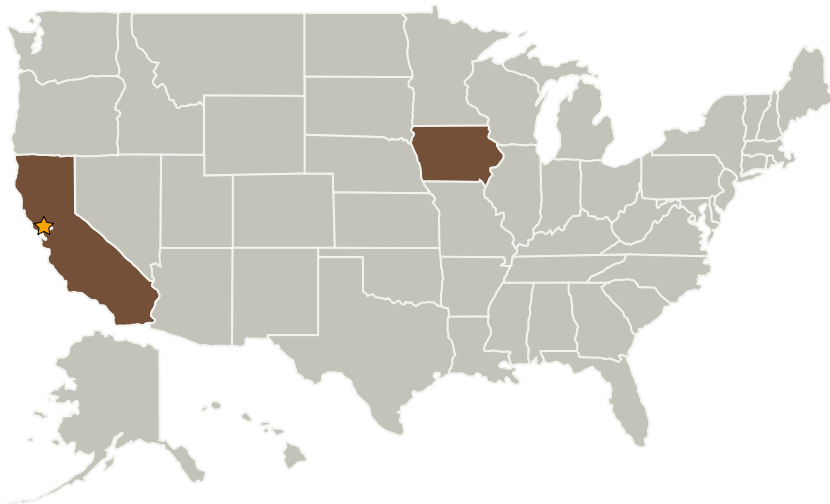
Completed Technology Project (2008 - 2008)



Project Introduction

Rotorcraft engineers traditionally use the wind tunnel to evaluate and finalize designs. Insufficient correlation between wind tunnel results and flight tests, have been often attributed in part to uncertainty in blockage corrections. Estimation of rotor blockage is significantly more complex than bluff body blockage as the correction depends on operational characteristics such as rotor RPM and thrust produced. This proposal offers to develop a design tool, which can simulate a complete rotorcraft inside a wind tunnel including all the facility effects. At the heart of the innovation are: 1. An automated hybrid grid generator. 2. A robust and economical incompressible flow solver for the grid system. 3. Momentum source based rotor model that is suitable and economical for simulating multiple rotors including the drive fans of the wind tunnel. Phase I will develop the proof-of-concept and will use unstructured Cartesian grid for the model and wind tunnel. The wind tunnel will be modeled with the diffuser, test section and nozzle. In phase II, the tool will be extended to hybrid grid with viscous grid near solid surfaces and will include drive fans of the tunnel.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Areas	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Sukra Helitek Inc.	Supporting Organization	Industry Women-Owned Small Business (WOSB)	Ames, Iowa

Primary U.S. Work Locations

California	Iowa
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Angela Lestari

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.8 Ground and Flight Test Technologies